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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,008	03/15/2004	Noriya Hayashi	080542-0166	6818

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EXAMINER	
LEONARD, MICHAEL L	
ART UNIT	**PAPER NUMBER**
1763	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,008	HAYASHI ET AL.	
	Examiner	Art Unit	
	MICHAEL LEONARD	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-7,9,10,12 and 16-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-7, 9-10,12, 16-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

Claims 6-7, 9, 16, and 18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 6 requires that the fibrous material be impregnated with the matrix resin "at room temperature" however applicants have failed to provide proper discussion of this new limitation - and therefore have failed to establish that they were in possession of the new claimed limitations at the time of filing.

Applicants' pointed to Example 2 in the present Specification as described in paragraph 0058. The only recitation of room temperature was when the curing agent and base resin were mixed. The step of impregnation at room temperature is not disclosed. The sentence in example 2 reads, "the transparent resin component was poured in the mold after defoaming and under vacuum…" this is considered the impregnation step and there is not disclosure that suggests that this step is done at room temperature. In fact, the

limitation "under vacuum", suggests that the temperature was increased to 60°C from line 15, page 20 of example 2.

Claim Rejections - 35 USC § 102/103

Claims 4 and 17 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent No. 5,071,613 to Fukami et al.

Regarding claims 4 and 17, the rejection has been previously set forth in the non-final rejection mailed 04/24/2009 and is herein incorporated by reference.

Claim Rejections - 35 USC § 103

Claims 6, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,613 to Fukami et al.

As to claims 6 and 18, as discussed above Fukami teaches a fiber reinforced polyurethane that is produced by impregnating a fibrous material with a polyurethane resin in a mold, however, there is no teaching that said impregnating step is done at room temperature and further fails to disclose the potlife.

Nevertheless, Fukami teaches that it is important to suppress increases in viscosity of the resin during impregnation (Column 3, lines 61+). Moreover, Fukami teach that the reactants making up the resin may react upon mixing – this reaction would increase viscosity. Therefore, it would be obvious to select a temperature that is below the

reaction temperature of the reactants - thereby preventing any unwanted premature reactions - while also choosing a temperature that will allow for sufficient flow (potlife) of the reactants - i.e. the impregnation temperature is a result effective variable.

Therefore, it would have been obvious to arrive at the claimed "room temperature" limitation since it has been held that discovering an optimum value of a result effective variable only involves routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Finally, it is noted that Fukami fails to disclose the glass transition temperatures for the relied upon polyurethane. Still, one of ordinary skill in the art would reasonably expect that the compositions produced using the same reactants in the same stoichiometric amounts would have the same material properties - including glass transition temperature.

As to claim 16, Fukami discloses resin transfer molding (Column 1, lines 19-21).

Claims 4-7, 10, 12, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,613 to Fukami et al. in view of U.S. Patent No. 5,032,622 to Herrington et al.

As to claims 4 and 6, the rejection has been previously set forth in the non-final rejection mailed 04/24/2009 and is herein incorporated by reference.

Furthermore, Fukami teaches that it is important to suppress increases in viscosity of the resin during impregnation (Column 3, lines 61+). Moreover, Fukami teach that the

reactants making up the resin may react upon mixing – this reaction would increase viscosity. Therefore, it would be obvious to select a temperature that is below the reaction temperature of the reactants - thereby preventing any unwanted premature reactions - while also choosing a temperature that will allow for sufficient flow (potlife) of the reactants - i.e. the impregnation temperature is a result effective variable.

Therefore, it would have been obvious to arrive at the claimed "room temperature" limitation since it has been held that discovering an optimum value of a result effective variable only involves routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Fukami fails to disclose the glass transition temperatures.

Herrington also teaches cured thermoset shape memory polyurethane that is the reaction product of di and tri-functional polyisocyanate and di and tri-functional polyol. The glass transition temperature of the polyurethane may extend to 120ºC, wherein said Tg is controlled by the selection of reactant (Column 3, lines 4-10 and 49-51).

Therefore, it would have been obvious to use a polyurethane in Fukamin having a Tg that coincides with applicants' claimed range because it is disclosed as being suitable for analogous thermoset, shape memory polyurethane, and a reasonable expectation of success has been established in arriving at said Tg since Herrington et al teach how it is controlled. Furthermore, one would be motivated to raise the Tg to temperatures of 120°C since it would prevent unwanted deformation at elevated temperatures, i.e. 80°C.

As to claims 5, 7, 10, 12, and 17-18, the rejection has been previously set forth in the non-final rejection mailed 04/24/2009 and is herein incorporated by reference.

Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,613 to Fukami et al. in view of U.S. Patent No. 4,251,428 to Recker et al.

As to claims 5 and 12, the rejection has been previously set forth in the non-final rejection mailed 04/24/2009 and is herein incorporated by reference.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,613 to Fukami et al. in view of U.S. Patent No. 4,738,999 to Blenner et al.

As to claim 9, the rejection has been previously set forth in the non-final rejection mailed 04/24/2009 and is herein incorporated by reference.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,613 to Fukami et al. in view of U.S. Patent No. 5,032,622 to Herrington et al. and further in view of U.S. Patent No. 4,738,999 to Blenner et al. for the reasons set forth in the last Office action.

Claims 4-7, 10, 12, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO-0216482 to Joshi et al. (U.S. Patent Pub No. 2003/0176561 will

be cited below). in view of U.S. Patent No. 5,071,613 to Fukami and U.S. Patent No. 5,032,622 to Herrington et al.

As to claim 4, Joshi discloses a process for the preparation of fiber reinforces composites in which the matrix polymer is derived from the catalyzed reaction of a liquid polyisocyanate containing material, the principle curing mechanism is the formation of urethane and/or isocyanurate linkages (Abstract). Joshi further discloses that the polyisocyanate component contains bifunctional and trifunctional MDI-components (0030-0037) that are liquid at room temperature (0026-0027) and the reaction product of the MDI-components with polyols. Joshi discloses that the preferred polyols are polyether and/or polyester based nominal diols that have hydroxy equivalent weights of from about 50 to about 2000 (0028). Joshi further discloses a Final MDI formulation wherein the base MDI is present from 50 to 95% by weight and the polyols are present from 5 to 50% by weight (0039-0040).

Joshi discloses an overlapping molecular weight of the polyol component, but fails to exemplify the use of a lower molecular weight polyol and further fails to disclose the Tg of the final polymer.

However, Fukami discloses a shape memory polyurethane that is prepared from polyisocyanates and polyols selected from various low molecular weight polyols, such as polyether and polyester polyols (Column 2, lines 47-50). Fukami further discloses that the polyol can be used with a hydroxyl value within the range of 300 to 800, and in this case if the hydroxyl value is smaller than 300 (larger molecular weight), the necessary

rigidity for construction material can not be obtained, while if it is larger than 800, impact resistance tends to be inferior, and also the reaction is too fast even without the use of catalyst, whereby penetration into fibrous reinforcing material tends to become undersirably difficult (Column 3, lines 19-27). The selection of the polyol component is a result effective variable.

Therefore, a person of ordinary skill in the art would have selected lower molecular weight in the ranges disclosed by Fukami in order to arrive at shape memory polymers with the above mentioned physical properties. Furthermore, it would have been obvious to arrive at the claimed "molecular weight" limitation since it has been held that discovering an optimum value of a result effective variable only involves routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Herrington also teaches cured thermoset shape memory polyurethane that is the reaction product of di and tri-functional polyisocyanate and di and tri-functional polyol. The glass transition temperature of the polyurethane may extend to 120ºC, wherein said Tg is controlled by the selection of reactant (Column 3, lines 4-10 and 49-51).

Therefore, it would have been obvious to use a polyurethane in Joshi having a Tg that coincides with applicants' claimed range because it is disclosed as being suitable for analogous thermoset, shape memory polyurethane, and a reasonable expectation of success has been established in arriving at said Tg since Herrington et al teach how it is controlled. Furthermore, one would be motivated to raise the Tg to temperatures of 120°C since it would prevent unwanted deformation at elevated temperatures, i.e. 80°C.

As to claims 5 and 12, as previously discussed Joshi discloses fiber reinforced thermoset, shape memory polyurethane, but fails to teach how much fiber reinforcement is present in said polyurethane. Nevertheless, one of ordinary skill would understand that the content of fiber reinforcement impacts the mechanical resiliency of the resulting polyurethane, i.e. the fiber content is a result effective variable. Therefore, it would have been obvious to arrive at applicants' claimed range since it has been held that discovering an optimum value of a result effective variable only involves routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

As to claim 6, Joshi discloses that the isocyanate (isocyanate and polyol composition) is kept at room temperature and the fibers are supplied to the isocyanate materials under conditions that prevent undesired reaction of the isocyanate material, preferably the fibers are treated so that they are substantially wetted by the isocyanate material. After treating the fibers the fibers are removed from the isocyanate material and treated with a suitable catalyst that will cause reaction of the isocyanate to form a polyurethane material. Therefore, even though Joshi fails to disclose the potlife of the polyurethane material a person of ordinary skill in the art could routinely work with the isocyanate and isocyanate-reactive components to arrive at the claimed potlife in order to completely ensure the complete wetting of the fibers without undesired reaction of the isocyanate material as evidenced by Joshi (0018). Furthermore, Joshi discloses keeping the catalyst separate and that the isocyanate final composition (polyol and isocyanate) is preferably a stable liquid at 25°C and has a viscosity less than 1000 cps but greater than

100 cps at 25°C (0042). Joshi further discloses that the isocyanate containing material is preferably liquid and has gel times ranging from 30 minutes to several hours (0158).

As to claims 7 and 10, Herrington teaches it is preferred to use polyol consisting of 98 equivalent percent of propylene oxide since it results in superior shape memory thermosets (Column 3, lines 49-53). Thus, it would have been obvious to arrive at applicants' claimed range since it is disclosed by Herrington et al. as being preferred polyol composition in analogous thermoset shape polyurethane and Joshi teaches polypropylene glycol as a suitable polyol.

As to claim 16, Joshi discloses that the application of the invention can be further extended to resin transfer molding (RTM) and its related processes such as vacuum assisted RTM (0062).

As to claim 17-18, Joshi, Fukami, and Herrington disclose polyols having low molecular weights and it would have been obvious to arrive at the claims Tg range because the Tg is controlled by the selection of reactant (See Herrington, Column 3, lines 4-10 and 49-51).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO-0216482 to Joshi et al. (U.S. Patent Pub No. 2003/0176561 will be cited below). in view of U.S. Patent No. 5,071,613 to Fukami and U.S. Patent No. 5,032,622 to Herrington et al. and U.S. Patent No. 4,738,999 to Blenner et al.

As previously discussed Joshi discloses fiber reinforced polyurethane, wherein combination of fibers may be included in the polyurethane depending on the desired performance of the final product (0045-0046). However, Joshi fails to disclose a method of producing laminates corresponding to claim 9.

Blenner teaches fiber reinforced polyurethane, wherein multiple layers of impregnated polyurethane resin may be stacked together and cured with heat and pressure causing the individual layers to stick thereby forming a laminate (Column 5, lines 18-34).

With this understanding, and the fact that Joshi teaches to have various types of fibrous material, one would be motivated to use the method of Blenner in Joshi since it allows the user to combine numerous layers of polyurethane – each having a different type of fibrous material - without having to impregnate all the various types of fibrous material at once (Joshi, 0045-0046, Fukami, Column 4, lines 54-58).

Response to Arguments

Applicant's arguments filed 03/01/2010 have been fully considered but they are not persuasive.

The applicants' argued that Fukami fails to disclose polyols with the preferred molecular weight. However, Fukami clearly discloses the use of a polyol component having a hydroxyl value of 300 to 800, this equates to the use of at least one bi-functional polyol component having an average molecular weight of between 374-140.25. This range clearly overlaps the ranges of instant claims 4 and 6.

The applicants' argued that one of ordinary skill in the art would not arrive at the presently recited "at room temperature" because it would not have been obvious to select a temperature that is "below the reaction temperature of the reactants." However, it would be obvious to select a temperature that is below the reaction temperature of the reactants - thereby preventing any unwanted premature reactions - while also choosing a temperature that will allow for sufficient flow (potlife) of the reactants - i.e. the impregnation temperature is a result effective variable. Furthermore, in order to completely wet of the fibers, the viscosity and potlife should be controlled and a person of ordinary skill in the art could control these parameters based on the isocyanate and isocyanate-reactive components, as well incorporating heat and/or catalyst to the reaction components to arrive at the desired potlife.

The applicants' argued that Herrington reference does not teach molecular weights of 100 to 250. However, Herrington teaches active-hydrogen containing materials with a functionality of 2 to 8 having an equivalent weight of 125 to 350, which equates to a molecular weight of 250 to 700, which touches the range disclosed in the instant claims. The applicants' further argued that a person of ordinary skill in the art would not range to Tg because as disclosed by Herrington the increase in Tg results in an undesirably short pot life. The applicants' argued that their invention provides the unexpected results of providing both a high Tg and an extended potlife. The applicants' failed to compare the closest prior art combination to the claimed invention and have not provided data

showing the unexpected result of extended potlife while increasing the Tg of the urethane.

In response to the Recker and Blenner references, these references were incorporated into the rejection to show that the selection of the amount of fiber reinforcement and the process of using multiple fiber reinforcement was known in the art to be prima facie obvious. The fact that the references disclose the use of chain extenders does not render the presently claimed invention less obvious because that specific limitation as already met and discussed using the primary references.

Applicants' pointed to Example 2 (to overcome the 112 rejection) in the present Specification as described in paragraph 0058. The only recitation of room temperature was when the curing agent and base resin were mixed. The step of impregnation at room temperature is not disclosed. The sentence in example 2 reads, "the transparent resin component was poured in the mold after defoaming and under vacuum…" this is considered the impregnation step and there is no disclosure that suggests that this step is done at room temperature. In fact, the limitation "under vacuum", suggests that the temperature was increased to 60°C from line 15, page 20 of example 2.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL LEONARD whose telephone number is (571)270-7450. The examiner can normally be reached on Mon-Fri 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on 571-272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Milton I. Cano/
Supervisory Patent Examiner, Art Unit 1763

/MICHAEL LEONARD/
Examiner, Art Unit 1763